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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/601,301

06/13/2003

Seiji Sarayama

2271/62289-Z

5867

7590

08/17/2006

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EXAMINER

HO, TU TU V

ART UNIT

PAPER NUMBER

2818

DATE MAILED: 08/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/601,301	SARAYAMA ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Tu-Tu Ho	2818	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 02 August 2006.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 94-106 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 96-106 is/are allowed.
- 6) ☒ Claim(s) 94 and 95 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☒ Certified copies of the priority documents have been received in Application No. 09/590,063.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                                   | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>05/30/2006</u> .  | 6) <input type="checkbox"/> Other: _____                                    |

### **DETAILED ACTION**

1. Applicant's Amendment filed 08/02/2006 has been reviewed and placed of record in the file.

#### ***Response to Arguments***

2. Applicant's arguments with respect to amended claims 94-95, filed 08/02/2006, have been considered but they are either not persuasive or moot in view of new ground(s) of rejection.

#### ***Claim Rejections - 35 USC § 103***

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. **Claims 94-95** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kidoguchi et al. U.S. Patent 6,136,626 (the '626 reference, cited in a previous office action) in view of Okumura U.S. Patent 6,456,640 (the '640 reference, cited in a previous office action) and further in view of DiSalvo U.S. Patent 5,868,837 (the '837 reference, cited in the parent application).

The '626 reference discloses an optical semiconductor device substantially as claimed including a substrate, but instead of teaching a bulk crystal substrate of GaN as claimed, the reference discloses a sapphire substrate.

Specifically, in reference to **claim 94**, the '626 reference discloses an optical semiconductor device comprising:

a bulk sapphire substrate (32, Fig. 1, col. 6, lines 44-67);

lower and upper cladding layers (36, 40) formed epitaxially on said bulk sapphire substrate (col. 8, lines 34-45); and

an active layer (38) formed epitaxially between said lower and upper cladding layers (col. 8, lines 34-45).

However, as noted above, the '626 reference, instead of teaching a bulk crystal substrate of GaN as claimed, discloses a sapphire substrate.

Okumura, in also disclosing an optical semiconductor device, teaches that a GaN substrate is advantageous over a sapphire substrate in that it has a lattice constant which is closer to that of a gallium nitride type semiconductor material deposited thereon (col. 7, lines 50-67).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the '626 reference's device such that the substrate is a GaN substrate in place of the sapphire substrate. One would have been motivated to make such a change in view of the teachings in Okumura that a GaN substrate is advantageous over a sapphire substrate in that it has a lattice constant which is closer to that of a gallium nitride type semiconductor material deposited thereon, in the instant case such as, for example, layers 34,36,38,40,42.

Furthermore, both the '626 reference and Okumura do not appear to disclose how to form such a GaN substrate, and in particular do not disclose a bulk crystal substrate of GaN comprising a slab of GaN single crystal.

DiSalvo, in also disclosing an optical semiconductor device, provides such a deficiency. Specifically, DiSalvo teaches a bulk crystal substrate of GaN comprising a slab of GaN single crystal produced by a process comprising the steps of:

forming a molten flux of a volatile metal element (sodium metal, column 4, lines 20-35) in a pressurized reaction vessel confining therein said molten flux together with an atmosphere

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containing N (nitrogen), such that said molten flux includes Ga in addition to said volatile metal element (column 4, EXAMPLE II, particularly “the nitrogen pressure in the autoclave was increased to 1,000 psi”);

growing GaN in the form of a single crystal body in said molten flux; and  
supplying a compound containing N directly into the atmosphere in said reaction vessel from a source located outside said reaction vessel (column 4, lines 31-52, particularly: “The autoclave was sealed, inserted into a furnace, and attached to a nitrogen line”)

because such a process is formed at low temperatures and is economically sound (col. 1, lines 25-50).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the ‘626 reference’s device using the GaN substrate taught by Okumura as detailed above, which GaN substrate is formed by the DiSalvo’s teachings. One would have been motivated to make such a change because such change produces a device with matched lattice constants and which is economically sound.

Referring to the limitation “during growth of said GaN single crystal”, said limitation is clearly a product-by-process limitation carrying patentable non-limitations. As provided for by MPEP 2113 [R-1], “[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985) (citations omitted) (Claim was directed to a novolac color developer. The process of making the developer was allowed. The difference between the inventive process and the prior art was the addition of metal oxide and carboxylic acid as separate ingredients instead of adding the more expensive pre-reacted metal carboxylate. The product-by-process claim was rejected because the end product, in both the prior art and the allowed process, ends up containing metal carboxylate. The fact that the metal carboxylate is not directly added, but is instead produced in-situ does not change the end product.).

In the instant case, the end product is said optical semiconductor device comprising said bulk crystal substrate of GaN comprising a slab of GaN single crystal, and as such is indistinguishable over said combined teachings.

If Applicant believes that the properties of the invention's end product are distinguished over the teachings' in particular and over the prior art of record in general, Applicant is reminded that the claims shall include such properties to be patentable over the prior art of record.

Referring to **claim 95**, because DiSalvo's process for forming the bulk crystal substrate of GaN comprising a slab of GaN single crystal comprises, as noted above and as acknowledged by Applicant in the Remarks filed 08/02/2006, page 8, supplying constitutional compositions under heated and pressurized N-supplying atmospheric condition, said DiSalvo's bulk crystal substrate of GaN comprising a slab of GaN single crystal should have a stoichiometric composition in the thickness direction thereof.

In addition, insofar as "stoichiometric composition in the thickness direction thereof" is concerned, Applicant appears to be contradicting when argued in said Remarks that "since the compound containing N is continuously supplied during the growth of the GaN, the pressure inside the reaction vessel is maintained generally constant during the growth of the GaN crystal once the state of the reaction vessel is stabilized" (emphasis added); but yet, Applicant discloses, specification, page 19, "N<sub>2</sub> pressure a necessary for maintaining the stoichiometric composition for the GaN bulk crystal 102B changes depending on the Ga content in the melt 102A represented in the horizontal axis. When the N<sub>2</sub> pressure in the atmosphere 107 is fixed ( $a_1=a_2$ ), it is not possible to maintain the stoichiometric composition for the GaN bulk crystal 102B. Thus, the present invention changes the N<sub>2</sub> pressure a in the atmosphere 107 with the progress of

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growth of the GaN bulk crystal 102B as represented as  $a_1 \neq a_2$ ” (emphases added); and as such the DiSalvo teachings appears to be more in line insofar as “stoichiometric composition in the thickness direction thereof” is concerned because, as noted above and as acknowledged by Applicant in said Remarks, the nitrogen pressure was changed.

***Allowable Subject Matter***

4. Claims 96-106 are allowable over the prior art of record.

The examiner’s statement of reasons for the indication of allowable subject matter was indicated in the office action mailed 12/15/2005.

***Conclusion***

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

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6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tu-Tu Ho whose telephone number is (571) 272-1778. The examiner can normally be reached on 7:30 am - 6:00 pm, Monday through Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on (571) 272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Tu-Tu Ho  
August 14, 2006